Topics to be Covered

- SQI Deployment Approach
- Deployment Responsibilities
- Progress and Lessons Learned
  - Education and Training
  - Communications and Outreach
  - Operations and Infrastructure
  - Project Support
- Organizational Change Mgmt. Concepts and Approach
- Deployment Element Activities
Active promote organizational change management.

Provide the infrastructure and operations support to facilitate deployment activities.

Interactively communicate with the project and practitioner communities about SQI activities, and promote and publicize knowledge about products, processes and events.

Provide education and training in the areas of process improvement, software management, software engineering, DSP processes, products, practices, metrics and tools.

Enable and promote software best practices, and leverage JPL experience in software engineering by providing project support to major software efforts throughout the entire software life-cycle.
Deployment Work Breakdown Structure

8.0 Deployment Element

8.1 Infrastructure & Operations
- 8.1.1 Deployment Infrastructure
- 8.1.2 Asset Mgmt. Approach
- 8.1.3 Operations Approach
- 8.1.4 Asset Deployment
- 8.1.5 Customer Lists
- 8.1.6 SQI Intellectual Property

8.2 Communication & Outreach
- 8.2.1 OCM Approach
- 8.2.2 JPL SW Web Site
- 8.2.3 SQI Briefings
- 8.2.4 SQI Publicity
- 8.2.5 Customer Feedback
- 8.2.6 NASA SWG Web Site

8.3 Education & Training
- 8.3.1 SW Training Approach
- 8.3.2 ESD Program 2000 SW
- 8.3.3 Process Improvement
- 8.3.4 Software Mgmt.
- 8.3.5 Software Engineering
- 8.3.6 SQI Element-Specific
- 8.3.7 NASA SWG Training Subgroup

8.4 Facilitate Project Support
- 8.4.1 Project/Practitioner Interface
- 8.4.2 Facilitate Consulting

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8.1. Infrastructure & Operations Components

- 8.1.1 Deployment Infrastructure
  - 8.1.1.1 CM-Controlled Electronic Library (MCDL?)
  - 8.1.1.2 DMIE/Rules! Content Maintenance
  - 8.1.1.3 Problem Management Tool, reports, analysis
  - 8.1.1.4 Configuration Management Tool, CCB

- 8.1.2 Asset Management Approach
  (Deployment Approach)

- 8.1.3 Operations Approach

- 8.1.4 Asset Deployment/Operations

- 8.1.5 Customer Lists

- 8.1.6 SQI Intellectual Property Issues
  (External Release)

8.2 Communication and Outreach Components

- 8.2.1 OCM Approach
  - 8.2.2 JPL Software Web Site
    - 8.2.2.1 Software Web Site Content Preparation
    - 8.2.2.2 Software Web Site Development/Maintenance

- 8.2.3 SQI Briefings
  - 8.2.3.1 SQI Project Briefings
  - 8.2.3.1 Technical/Awareness Briefings

- 8.2.4 Publicity

- 8.2.5 Customer Feedback Mechanisms
  - 8.2.5.1 Customer Clearinghouse – Potential Opportunities, Annotated List, Marketing Leads
  - 8.2.5.2 Problem Resolution

- 8.2.6 NASA SWG Web Site

Legend:
Black = Deployment Element
Blue italics = Other SQI Elements

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8.3 Education and Training Components

- 8.3.1 Software Training Approach & Ops
  - 8.3.1.1 Course Planning/Curriculum Development
  - 8.3.1.2 Classroom/Registration Mgmt.
  - 8.3.1.3 Training Evaluations, Metrics
- 8.3.2 ESD Program 2000 Software Modules
  - 8.3.2.1 Course Content Development
  - 8.3.2.2 Content Review
  - 8.3.2.3 Classroom Instruction
- 8.3.3 Process Improvement
- 8.3.4 Software Management (content dev., inst.)
- 8.3.5 Software Engineering (content dev., inst.)
- 8.3.6 SQI Element-Specific (content dev., inst.)
- 8.3.7 NASA SWG Strategy 4 Subgroup (Training)

8.4 Project Support Components

- 8.4.1 Project/Practitioner Interface
  - 8.4.1.1 SQI Project Points of Contact (POCs)
    - inbound untargeted queries,
  - 8.4.1.2 Help Desk, Maintain FAQs, Generate FAQs Answers
  - 8.4.1.3 Subject Matter Expert (SMEs) List (Line Management Role)
- 8.4.2 Project Consulting
  - 8.4.2.1 Facilitate Project Consulting
  - 8.4.2.2 Answer Simple Questions (< 2 hr.)
  - 8.4.2.3 In-depth Consulting (several days or weeks)

Legend:
Black = Deployment Element
Blue italics = Other SQI Elements

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Progress and Lessons Learned (1)

Education and Training

Progress:

- Generated a JPL Software Training Plan that addresses the CMM Level 3 Training Program KPA
  - Coordinated plan with all software training providers on lab
- Offered courses in Overview of CMMI, Intro. to CMMI, \textit{MPI}
- Created courses for Software Management and Software Engr.

Lessons Learned:

- Don't limit the scope of the plan to the software initiative only, otherwise you will not comply with the Training Program KPA.
- Be sure to train all relevant stakeholders in CMMI.
- Need dual emphasis for managers and practitioners.
Sources of Training Requirements

NASA Directives, Guidelines, Standards, Prime Contract, NIAT Report, etc.

NASA IT Workforce Challenge Team

NASA Software Working Group (SWG), NASA Code FT

Industry Benchmarks (Other Institutions)

Academia

JPL ESD Training Committee

JPL Software Cost Growth Study, ISO CANs, MCO/MPL Failures, etc.

JPL Flight Projects, JPL Software Community

Other SQI Elements (Process & Product, Measurement, Tools)

JPL Software Training Plan

- Technical Division needs, software management, software engineering
- software management, software tracking, software cost estimation
- software management, software engineering, IT technical disciplines
- processes, products, tools, technologies
- common core curriculum, software management, software engineering, technologies
- process improvement, common core curriculum
- IT core competencies
- software management, IT Security, etc.

SOFTWARE ELEMENTS (Process & Product, Measurement, Tools)

Common Core Standards

Standards Benchmarks (CMMI, IEEE, ISO, etc.)
Roles of JPL Training Providers

General
Role-based Training

Process, SW Mgmt. SW Engr.

Software Architecture

Specific Methodologies, Languages, Tools, etc.

Specific COTS Design Tools esp. for chip design

Human Resources Prof. Dev.

PDC Design Hub

Specific

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Progress and Lessons Learned (2)

Communications and Outreach

Progress:

- Initial Operating Capability (IOC) of JPL Software Web Site delivered on May 6, 2002 (http://software.jpl.nasa.gov)
- Developed SQI Project Briefing package to give an overview.
- Developed Communications Log Sheet to “capture” issues from presentations, and to record audience reached.

Lessons Learned:

- Users prefer an “index style” structure for the Home Page, and there are design implications -- Scrolling vs. Pull-down menus
- Need different “flavors” of presentations for different stakeholders
- Need tracking mechanisms to “capture” customer interactions, but some are reluctant to take the time to complete them.

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JPL Software Web Site Home Page

Software Practices
- Flight Project Software Practices
- Flight Project Software IV & V Practices
- Design Principles
- Develop Software Products (DSP)
  - Process Requirements
  - Waivers

Resources
- Checklists & Forms
- Engineering Models
- Handbooks
- Reference Material
- Sample Documents
- Software Tool Catalog
- Standards and Guidelines
- Templates

Services & Support
- Communications & Presentations
- Consulting & Project Support
- Metrics Consulting & Analysis
- News Groups
- Software Assessments
- Software Tool Service
- Subject Matter Experts (SMEs)

Education & Training
- Conferences
- Seminars
- Training Courses
- Workshops

Required Activities
Management Activities
- Software Management & Development Planning
- Software Cost Estimation
- Software Risk Management
- Software Supplier Agreement Management
- Software Development Monitoring & Control
- Software Configuration Management

Engineering Activities
- Software Requirements Development & Management
- Software Design
- Software Implementation
- Software Delivery
- Software Maintenance

Verification & Validation (V&V) Activities
- Software Process & Product Verification
- Software Reviews
- Software Integration and Testing

Other Sites of Interest

LATEST NEWS

New SQI Project Manager
On 02/25, Frank Kuykendall will officially return to JPL as the new SQI Project Manager.
MORE>

D. Nichols Leaves SQI
David Nichols moves on to become the Div-36 Assistant Division Manager for Flight Projects. David will retain his role as JPL Software Process Owner and SEMOG chair for now.
MORE>

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Progress and Lessons Learned (3)

**Infrastructure and Operations**

**Progress:**
- Selected Remedy ARS for Customer Support and designed schema to match products and services on Web Site

**Lessons Learned:**
- SQI Assets need to be under CM control before being deployed.

**Project Support**

**Progress:**
- Delineated responsibilities for providing actual project support vs. infrastructure to support and facilitate it.

**Lessons Learned:**
- It's best to just facilitate the process and leave the actual instruction and consulting sessions to the experts.
Support to Projects and Programs

Type of Support Provided

- **Consulting**
  - Cost/risk estimation
  - Metrics
  - Defect classification
  - Use of IV&V for software

- **Software Document Templates**
  - Software Management Plan
  - Software Requirements Doc.
  - Release Description Doc.

- **Coding Standards**

- **Software Development Tools**
  - Evaluation and demos
  - Operational tool service

- **Software Stress Testing Hdbk**

Known Users

- MER, ST-6
- MER, MONTE, TMOD
- MER
- MER

- Deep Impact, Europa Orbiter, MER, MRO/Electra, Project Support Office
- MRO/Electra, SMEX/STEP, ST-6
- MDS
- DSN-Madrid

- MER, others

- Deep Impact

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How Individuals Commit to Change

- Contact Awareness
- Understanding
- Installation or "Trial Use"
- Adoption
- Institutionalization

Commitment vs. Time

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Technology and Change Adoption Categories

✧ Innovators
  ➢ Will settle for buggy or difficult-to-use solution components; are accustomed to finding their way around the glitches.

✧ Early Adopters and Early Majority
  ➢ Can see the strategic advantage of the improvement or change and are willing to help the organization get there.

✧ Late Majority
  ➢ Need a lot of support to adopt the solution component.

✧ Laggards
  ➢ Are very resistant to changing the status quo, despite the effectiveness of the solution component.
Change Management Approach

✧ Generate an SQI Organizational Change Management (OCM) approach that defines the following:

➤ Change management strategies
  ✧ Plans to move up the OCM curve
➤ OCM training for SQI Team & JPL Sr. management
➤ Infusion goals and change acceptance time lines
➤ Themes and thrusts
➤ Key stakeholders and segments
➤ Communications vehicles
➤ SQI logos and tag lines
➤ Interactions amongst the SQI elements and other process improvement activities to achieve the changes.
The JPL Software Community

- **Flight Software Applications**
  - Fault Protection
  - Guidance, Flight Navigation, Control (GNC)
  - Command and Data Handling (C&DH)
  - Science Instrument Software

- **Ground Software Applications**
  - DSN Monitor and Control
  - Telecommunications
    - e.g., Telemetry, Tracking, Command, Data Mgmt., Uplink, Downlink
  - Mission Services & Applications
    - e.g., Mission Planning, Sequence Design, Mission Control, Flight Engineering
  - Tracking and Navigation
    - e.g., SPICE, MAS, MONTE
  - Antennas and Microwave
  - Spacecraft Simulation (SIM)

- **Science Software Applications**
  - Science Data Processing
  - Science Analysis
  - Science Data Archive Systems

- **Other Applications**
  - EIS Infrastructure (services)
  - New Business Systems (NBS)
  - Reimbursable Systems
  - Technology and R&D

Red = Mission-Critical Software

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<th>Level</th>
<th>Focus</th>
<th>CMMI Process Areas</th>
<th>Category</th>
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<td>Continuous Process Improvement</td>
<td>Organizational Innovation and Deployment (OID)</td>
<td>Process Mgmt. Support</td>
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<td>Causal Analysis and Resolution (CAR)</td>
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<td>Integrated Project Management for IPPD (IPM)</td>
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<td>Risk Management (RSKM)</td>
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<td>Integrated Teaming (IT)</td>
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Carnegie Mellon University, Software Engineering Institute (SEI)
SQI Implementation Phasing

Mission-Critical Software
- Establish JPL SQI Infrastructure
  - Define and deploy core processes
  - Establish JPL software profile
  - Establish measurement program
  - Provide Project consulting resources

All Mission Software
- Execute Defined Process
  - Assess effectiveness
  - Establish engineering models
  - Tailor for specific domains

All Software
- Institutionalize SQI
  - Optimize processes
  - Operationalize Project support
  - Tailor for additional domains

Level of Deployment

FY02-04
FY05-06
FY07-08

05/08/2002
Backup Slides
Define the Software Training approach in a JPL Software Training Plan.
- Training strategy, courses offered, frequency and schedule

Continue to support the ESD Program 2000 role-based training courses.
- Software modules for PMs, PEMs and Cog Es.

Coordinate with NASA Code FT and CSM regarding offering process improvement courses at JPL.

Promote and conduct the Software Management & Planning course.

Promote and conduct the new Software Product Engineering course.

Coordinate with HR Professional Development Technical Training and ITET regarding software training requirements and course offerings.

Develop training needed by other SQI Elements.
- Tools and Techniques, Metrics, Cost Estimation, Processes, etc.

Support the NASA SWG Strategy 4 (Training) Subgroup.

05/08/2002
Communications Activities

- Define and implement the SQI OCM approach.
- Generate the SQI Communications Plan.
- Develop and maintain the JPL Software Web Site.
- Develop SQI Briefings
  - "Road Show", technical, awareness
  - Package for the SEMOG to use to communicate with TGSs & PEMs.
- Generate publicity materials and publicize via various media.
- Actively seek customer feedback and "capture" customer interactions
  - User surveys, user forums, Web suggestions, customer contact record, communications logs, etc.
- Provide on-going Web Support for the NASA SWG.

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**Operations and Infrastructure Activities**

- Develop SQI Deployment Infrastructure
  - Configuration Management, Problem Management
  - Electronic Library, DMIE/JPL Rules! Interface
- Define SQI Asset Deployment Management Approach
- Define SQI Operations Approach
- Deploy SQI Assets
  - Publish new DSP standards on DMIE/JPL Rules!
    - Process Description Document, Develop Software Products (formerly DSP Policy)
    - Procedures for Mission-Critical Software
    - Software Design Principles *upon approval by PEMC*
  - Ensure SQI Assets are under CM Control
- Maintain Customer Lists (Project, Line, Interest Areas)
- Coordinate SQI Intellectual Property (IP) Issues

05/08/2002
Facilitate Project Support Activities

- Serve as SQI POC and direct requests to SQI Experts.
- Establish network of Subject Matter Experts (SMEs) to assist projects in deploying SQI products.
- Maintain list of Frequently Asked Questions (FAQs)
- Provide HelpLine Support
- Facilitate consulting support to JPL projects.
Deployment Management and Planning Activities

- Define scope, schedule and budget for the SQI Deployment Element.
  - Work Breakdown Structure (WBS) and WBS Dictionary
  - Work Agreement and WAMs for FY 2002
  - Level 3 schedule in MS Project and FastTrack
  - Budget in RMS FFE and NBS BDE
- Track and Report Deployment Element Activities
  - Generate MMR and Quarterly Report presentations
  - Collect and analyze DE and customer metrics
- Coordinate with other SQI Elements & SQI Project Engr.
  - Review their work agreements and work products, and meet with element leads to develop and coordinate plans for deploying them.
- Coordinate with external entities
  - SEMOG, HR Prof. Dev., ESD Program 2000, ITET, CSM, NASA SWG, NASA Code FT, SQA, Formulation Phase Support Team, JPL Rules!, EPSPO, CSMISS, MDS, etc.